4. Azure For .NET Developers

Azure For .NET Developers Topics

Front Door

Key Vault

Blob Storage

Managed Identity

Web App

Static
Web App

Front-ends

Microsoft Entra

Back-end API
Web App

PostgreSQL

Browser

Cloud Computing
& Azure

React

Blazor

Back-end
API

Azure Cloud

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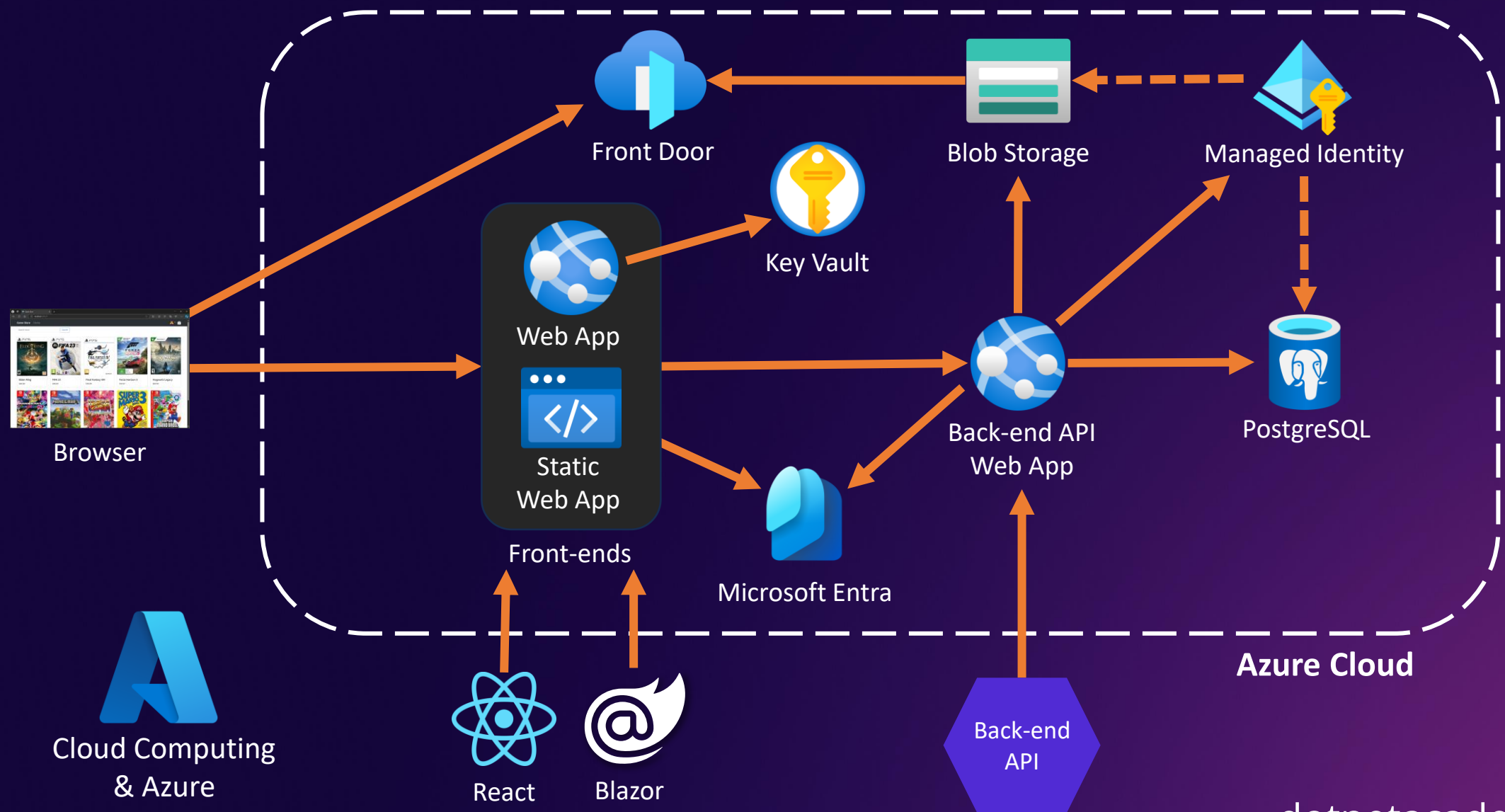
What you need to know first
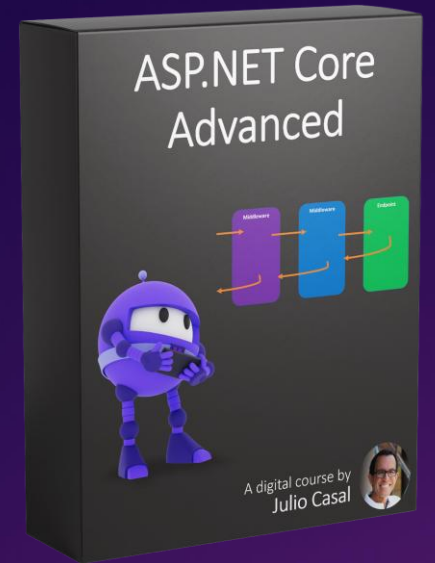
ASP.NET Core REST APIs

Working With Data (EF Core)

Configuration, Middleware & Logging

Using Postman

Authentication & Authorization

OAuth 2.0 & OpenID Connect

ASP.NET Core
Essentials

.NET

A digital course by
Julio Casal

ASP.NET Core
Advanced

A digital course by
Julio Casal

ASP.NET Core
Security

A digital course by
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Software prerequisites

Azure Storage Explorer
https://storageexplorer.com

Azure CLI
https://learn.microsoft.com/cli/azure/
install-azure-cli

Node.JS (optional)
https://nodejs.org/en/download
(latest LTS version)

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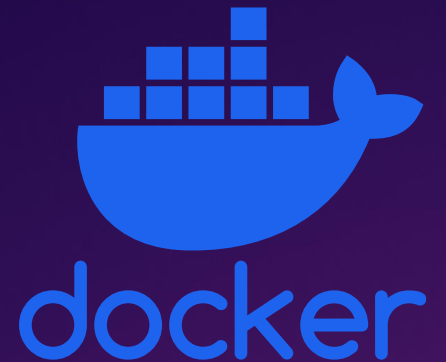
What is cloud computing?

Traditional infrastructure

The App

More Apps

Server

Server 2   Server 4

Server 3   Server 5

Physical Data Center
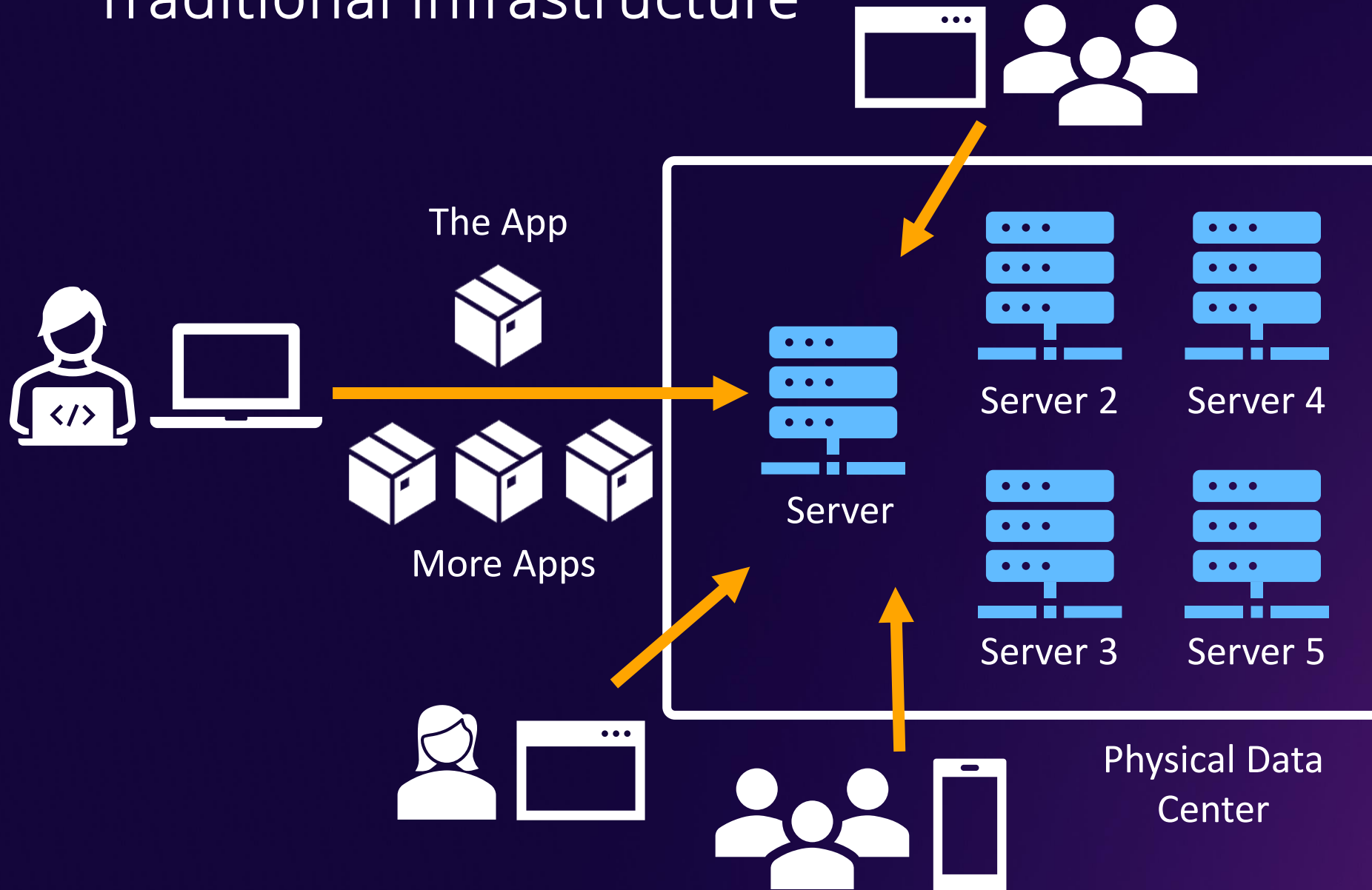
Challenges

Buying servers is expensive

Configuring servers is slow and error prone

Only so many servers in a physical data center

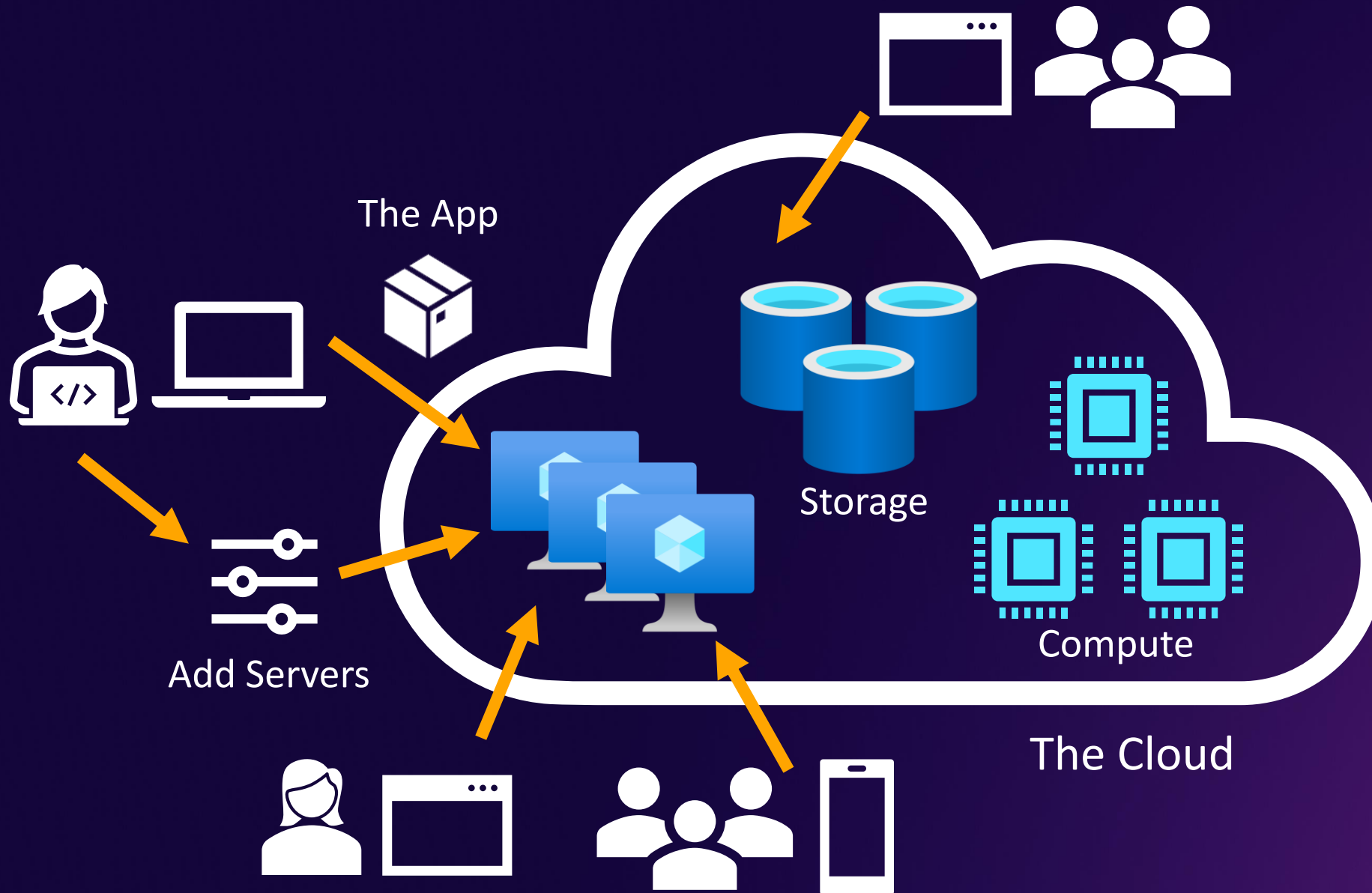Wasted resources

Multiple servers to patch

Need dedicated IT personnel

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What is cloud computing?

Cloud computing is the on-demand delivery of IT resources over the Internet
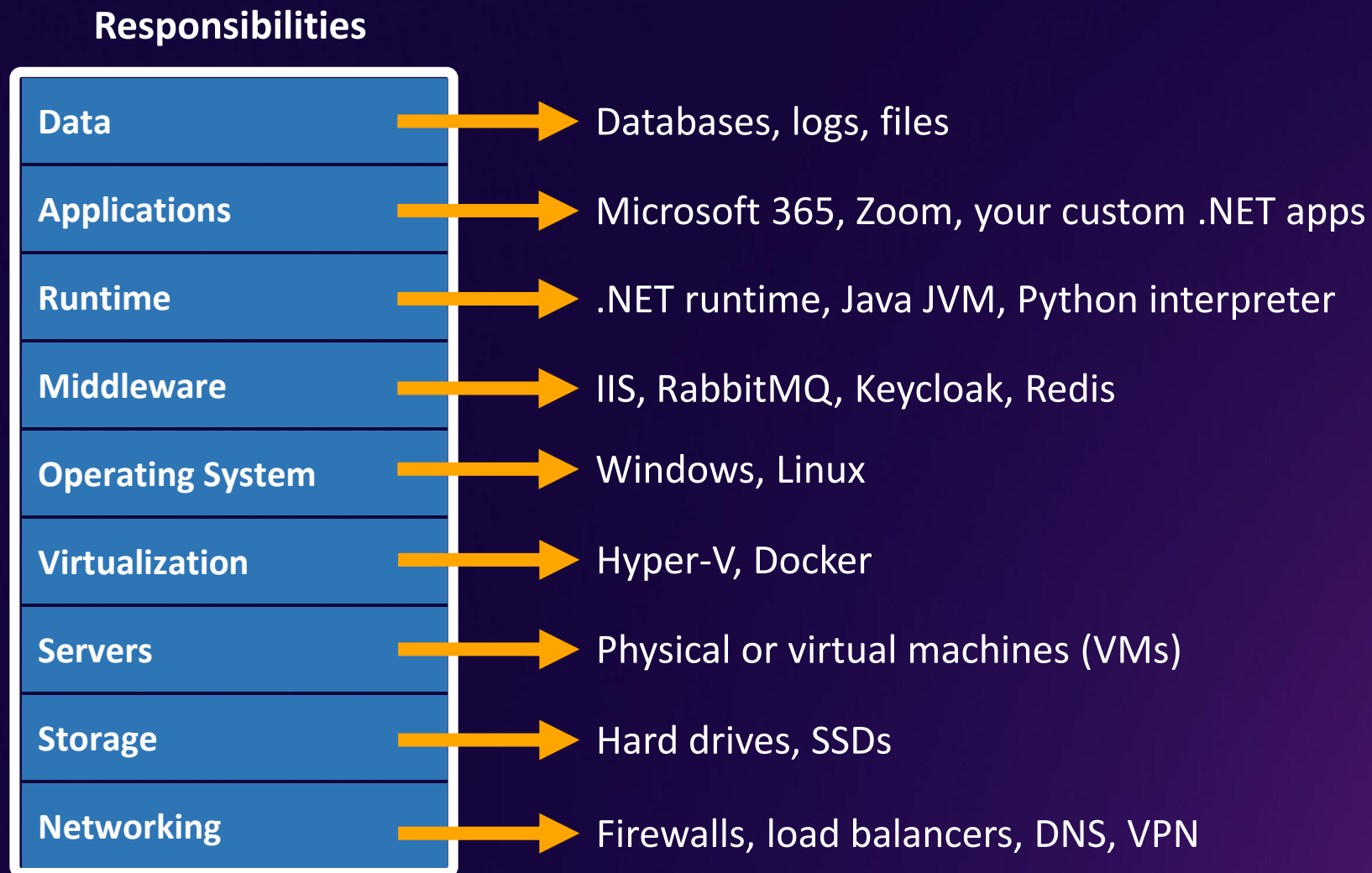
The shared responsibility model

What is the shared responsibility model?

Defines how cloud providers and customers split security and management duties when using cloud services

The shared responsibilities

Responsibilities
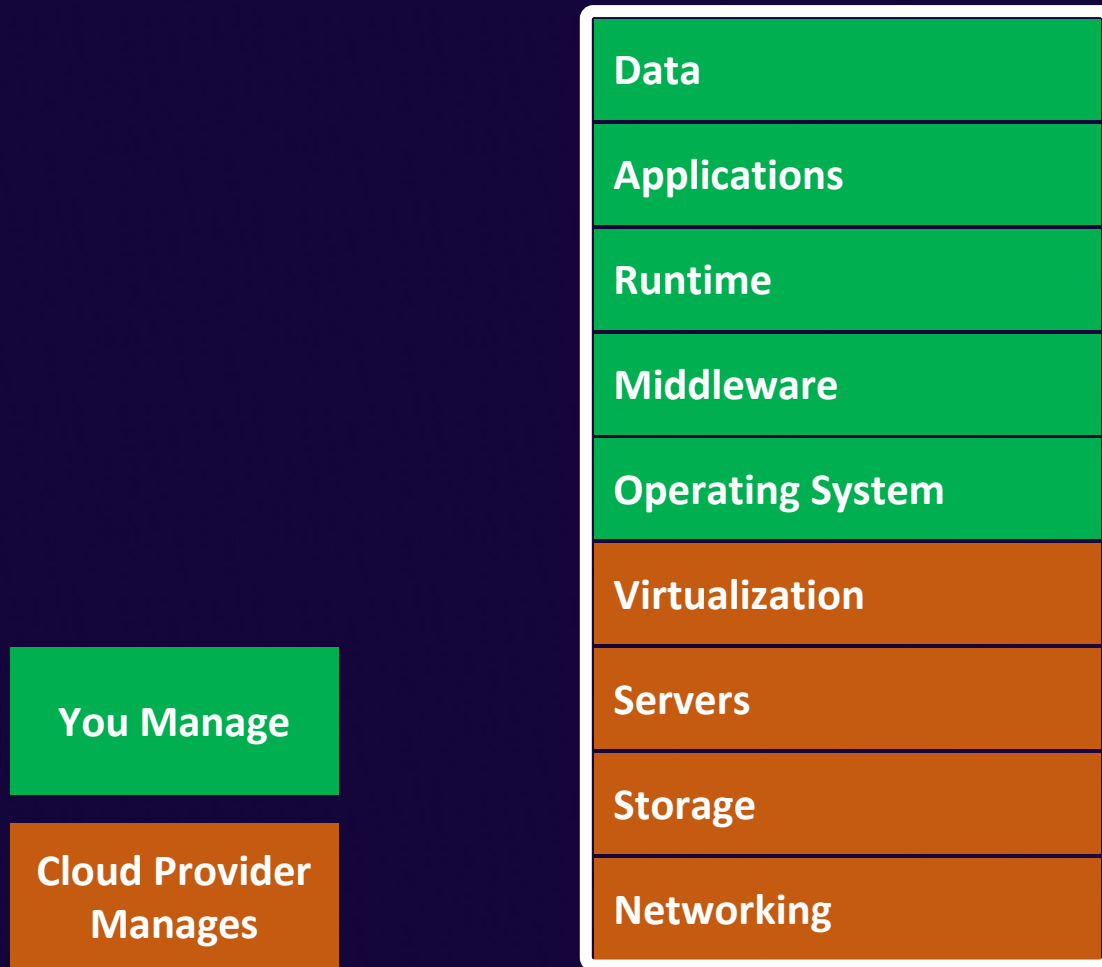
Data	→ Databases, logs, files
Applications	→ Microsoft 365, Zoom, your custom .NET apps
Runtime	→ .NET runtime, Java JVM, Python interpreter
Middleware	→ IIS, RabbitMQ, Keycloak, Redis
Operating System	→ Windows, Linux
Virtualization	→ Hyper-V, Docker
Servers	→ Physical or virtual machines (VMs)
Storage	→ Hard drives, SSDs
Networking	→ Firewalls, load balancers, DNS, VPN

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Cloud service models

3 cloud service models

Infrastructure as a Service (IaaS)

Platform as a Service (PaaS)

Software as a Service (SaaS)

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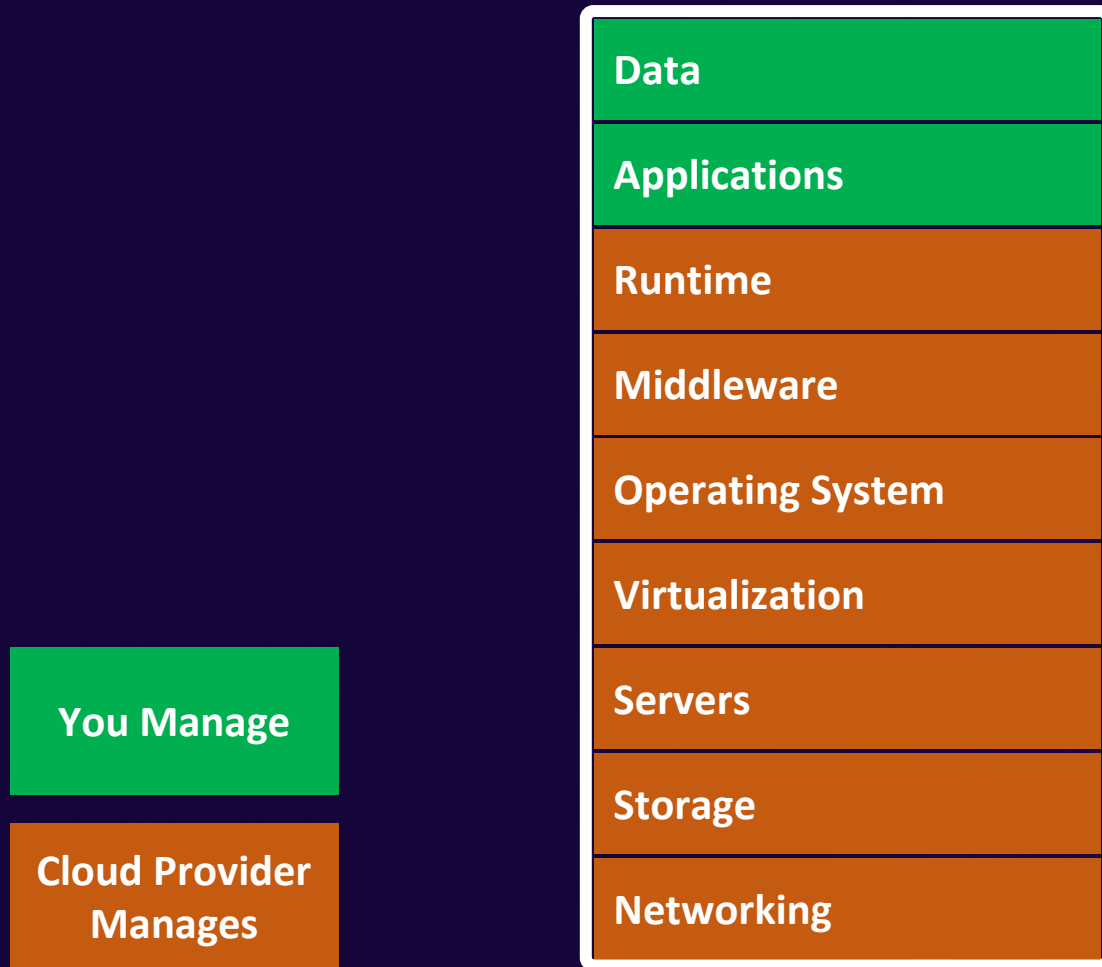# Infrastructure as a Service (IaaS)

Data
Applications
Runtime
Middleware
Operating System
Virtualization
Servers
Storage
Networking

You Manage

Cloud Provider Manages

The cloud provider manages the physical infrastructure, while you control everything on top

Scenarios

- Lift-and-shift migration

- Testing and development

- Disaster recovery and backups

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Platform as a Service (PaaS)

Data
Applications
Runtime
Middleware
Operating System
Virtualization
Servers
Storage
Networking

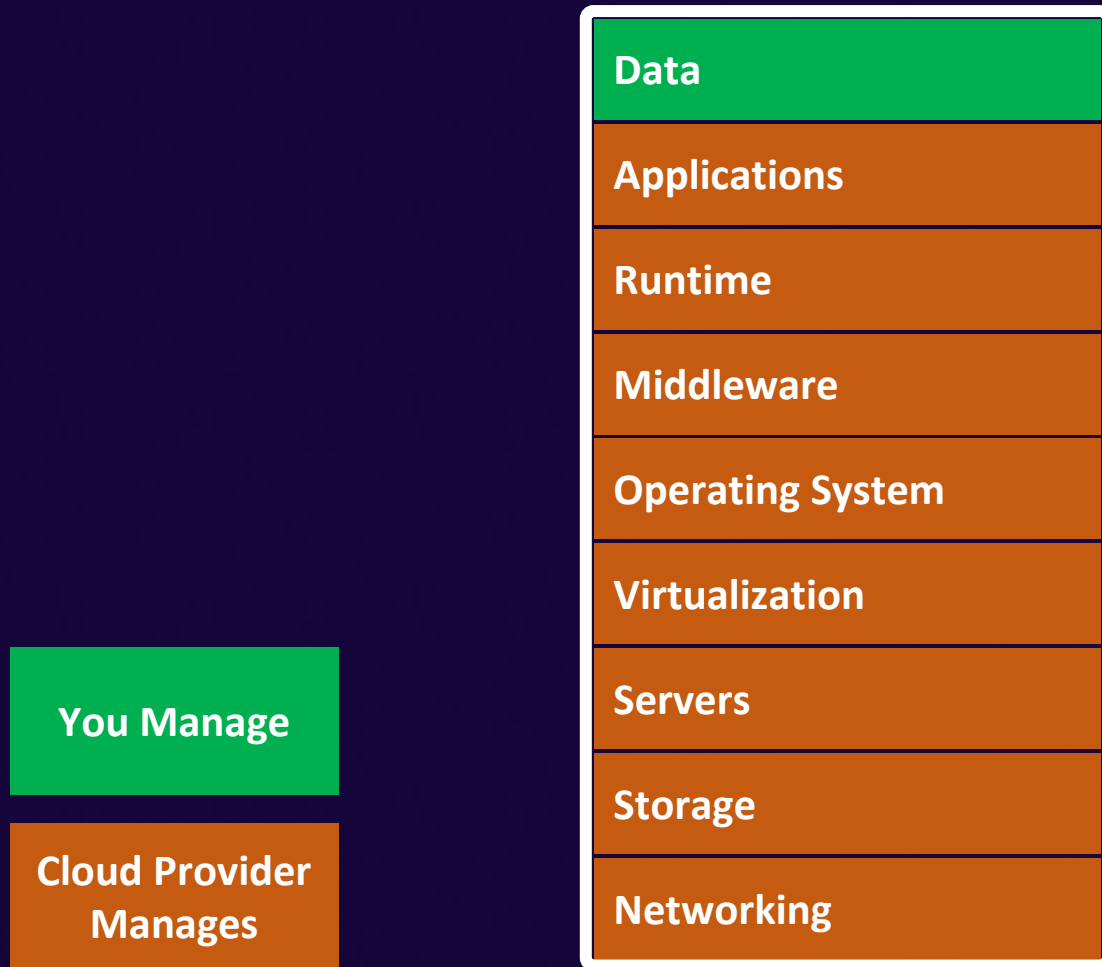**You Manage**

Cloud Provider Manages

You are responsible for your application code and data, while the cloud provider handles everything else.

Scenarios

- Rapid Application Development
- Analytics or business intelligence
- AI and Machine Learning

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Software as a Service (SaaS)

Data
Applications
Runtime
Middleware
Operating System
Virtualization
Servers
Storage
Networking

You Manage

Cloud Provider Manages

You are responsible for managing your data, while the cloud provider manages everything else.

Scenarios

- Collaboration and Productivity
- Customer Relationship Management (CRM)
- Email and Communication

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The focus of this course

IaaS

Data
Applications
Runtime
Middleware
Operating System
Virtualization
Servers
Storage
Networking

PaaS

Data
Applications
Runtime
Middleware
Operating System
Virtualization
Servers
Storage
Networking

SaaS

Data
Applications
Runtime
Middleware
Operating System
Virtualization
Servers
Storage
Networking

You Manage

Cloud Provider Manages

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What Is Microsoft Azure?

What Is Azure?

Azure is Microsoft's cloud computing platform for building, deploying, and managing applications globally

Azure services

AI + Machine Learning	Analytics	Compute	Databases	Development	Identity + Security	IoT + MR	Integration	Management + Governance	Media + Comms	Migration	Networking	Storage
AI Bot Service	Analysis Services	App Service	Apache Cassandra MI	App Configuration	Azure AD EI	Azure Maps	API Center	Automation	Azure CDN	Azure Migrate	Application Gateway	Avere vFXT
Azure AI Foundry	Azure Purview	Azure Batch	Cosmos DB	Azure Chaos Studio	Azure Key Vault	Azure Sphere	API Management	Azure Advisor	Azure Comms. Gateway	Data Box	Azure Bastion	Azure Elastic SAN
Azure AI Search	Data Explorer	Azure Functions	Database for MariaDB	Azure DevOps	Copilot for Security	Defender for IoT	Energy Data Manager	Azure Arc	Comm. Services	DB Migration Service	Azure DNS	Azure NetApp Files
Azure AI Services	Data Factory	Azure Quantum	Database for MySQL	Azure Spring Apps	DDoS Protection	Digital Twins	Event Grid	Azure Automanage		Resource Mover	Azure Firewall	Azure Storage
Machine Learning	Databricks	Azure Red Hat OpenShift	Database for PostgreSQL	Deployment Environments	Dedicated HSM	IoT Central	Health Data Services	Azure Backup		Site Recovery	Azure Front Door	Confidential Ledger
Microsoft Genomics	Event Hubs	Azure VMware Solution	Managed Redis	DevTest Labs	Defender EASM	IoT Edge	Logic Apps	Azure Blueprints			Azure Orbital	Container Storage

Image credits: https://azurecharts.com

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Azure global presence

Datacenter
Edge
Network

300+
datacenters

60+
regions

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Azure for developers

Languages

Tools

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Getting Azure Credits

2 ways to get Azure credits

Free Options

Paid Options

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Free: Azure free account

- Available only to new Azure customers
- Free access to 20+ popular services for 12 months
- Access to 65+ always-free services
- $200 credit to access anything else for 30 days
- Credit card needed, but won't be charged
- Link: **https://azure.microsoft.com/free**

Free: Azure for students

- Available to full-time students of accredited, degree-granting two-year or four-year educational institutions

- Same access to free Azure services as Free account

- $100 credit to access anything else within 12 months

- No credit card needed

- Link: **https://azure.microsoft.com/free/students**

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Free: Microsoft Learn sandbox

- Available to everyone via specific MS Learn training modules

- Can use up to 10 sandboxes per day (but only 1 sandbox at a time)

- Each sandbox can be used for up to 4 hours

- Can't save progress after the sandbox times out

- Available regions, resources and SKUs vary per MS Learn module

- No credit card needed

- Link:
  https://learn.microsoft.com/training/support/faq?pivots=sandbox

Free: Microsoft for Startups

- Available to startups that meet specific criteria (see link below)

- Grants from $1,000 to $150,000 in Azure credits

- Need to apply and wait for review

- This is what your instructor (Julio) uses

- Link:

  https://learn.microsoft.com/microsoft-for-startups/benefits/azure

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Paid: Visual Studio Subscription

- Requires an active Visual Studio subscription
- Grants monthly credits based on the type of subscription:
  - Enterprise: $150/mo
  - Professional: $50/mo
- Can't be used for production workloads
- Link:
  https://learn.microsoft.com/visualstudio/subscriptions/faq/subscriber/azure

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Paid: Pay as you go

- Available to everyone
- You pay only for what you used during the month
- Any monthly free amounts available are consumed first
- You should carefully monitor your usage
- Link:

  https://azure.microsoft.com/pricing/purchase-options/azure-account

Azure infrastructure basics

Azure core infrastructure layers

Physical Infrastructure

Management Infrastructure

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Azure physical infrastructure

Region: East US

Availability Zone #1
DC #1   DC #2

Availability Zone #2
DC #3   DC #4

Availability Zone #3
DC #5
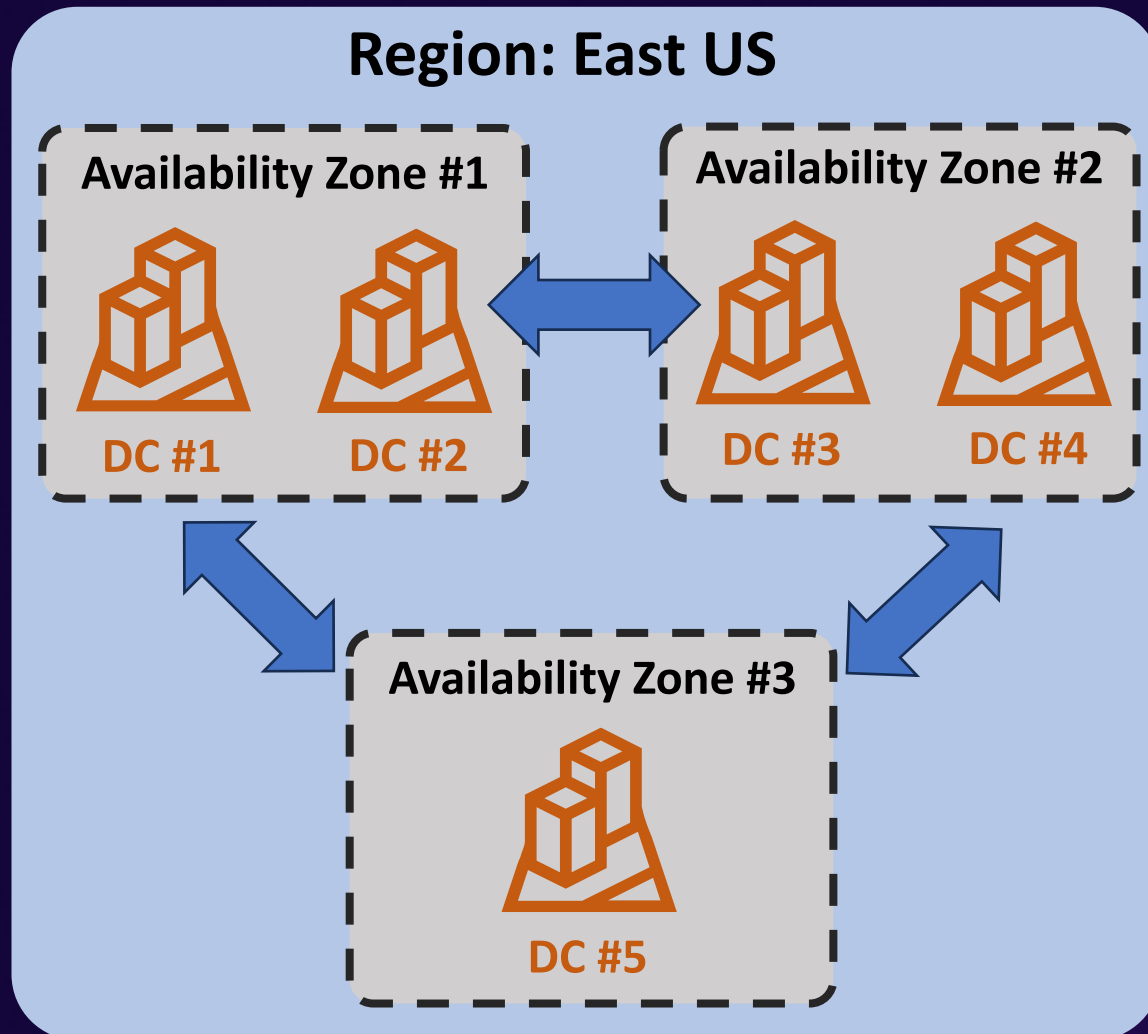
Datacenter: The actual physical buildings housing servers and networking equipment.

Region: A geographic area containing at least one data center (usually multiple). 60+ regions globally.

Availability Zone: Physically separate facilities within a region, each with independent power, cooling, and networking.

- Availability zones are several miles apart

- If one zone goes down, the other zones continue working

- Zones are close enough to maintain extremely low latency connections

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Azure management infrastructure

Management Group

Dev Subscription

App1 Resource Group

App2 Resource Group
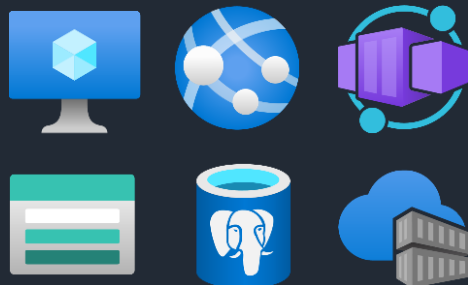
Test Subscription

Prod Subscription

Resource: An individual Azure service instance. The basic building block in Azure.

Resource group: A logical container for related Azure resources that are managed together as a single unit.

Subscription: A billing and access control boundary that organizes resource groups.

Management group: A container for organizing multiple subscriptions to apply governance.

- Role-based access control (RBAC) is used to manage permissions at each level of the hierarchy.

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Azure Hosting Options

Choosing a hosting model

Virtual machine

Good: Complete control over environment, OS, and dependencies

Bad: Heavy maintenance burden and infrastructure responsibilities

App Service

Good: Simplest path to Azure by deploying with a few clicks

Bad: Expensive at scale, poor revision management

Kubernetes Service

Good: Powerful container orchestration with scaling flexibility

Bad: Complex configuration requiring specialized infrastructure knowledge

Container Apps

Good: Container benefits without full Kubernetes complexity

Bad: Requires additional container development skills

Functions

Good: Pay-per-execution model ideal for event driven workloads

Bad: Not designed for continuously running apps

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Introduction to Azure App Service

What is Azure App Service?

- A fully managed PaaS for hosting web applications

- Can host .NET, Java, Node.js, Python and PHP apps

- Available in both Windows and Linux environments

- Features auto scaling and load balancing

- Built-in SSL/TLS support

- Offers multiple pricing tiers

- Includes continuous deployment capabilities

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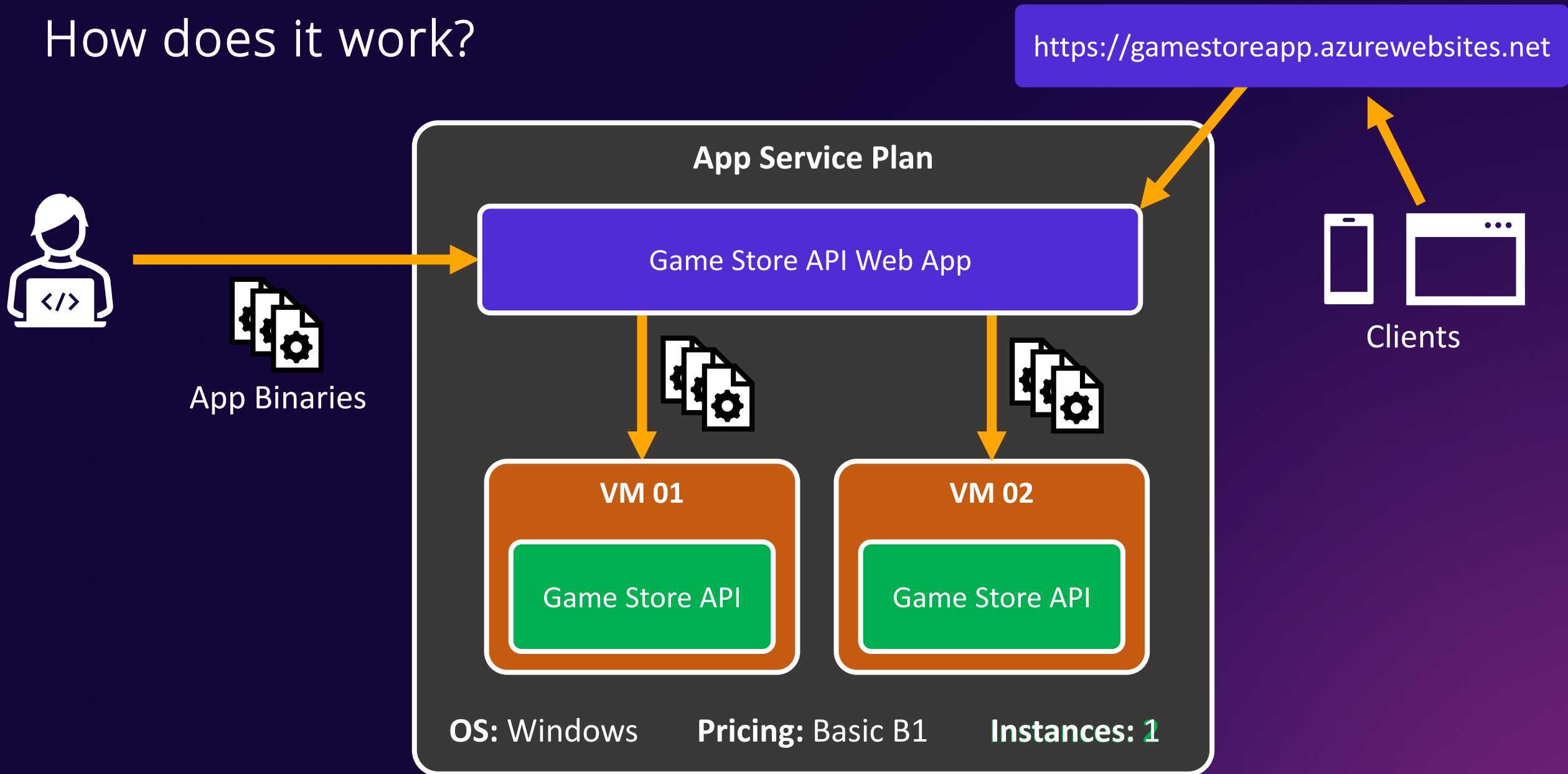
Introduction to Microsoft Entra

What is Microsoft Entra?

- Microsoft's identity and security platform

- Rebranded from Azure Active Directory in 2022

- Entra ID provides identity services for internal users

- Entra External ID manages customer identities

- Can be managed via the Admin Center and Graph API

- The Microsoft Identity Platform enables developers to integrate identity into their apps

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How does it work?

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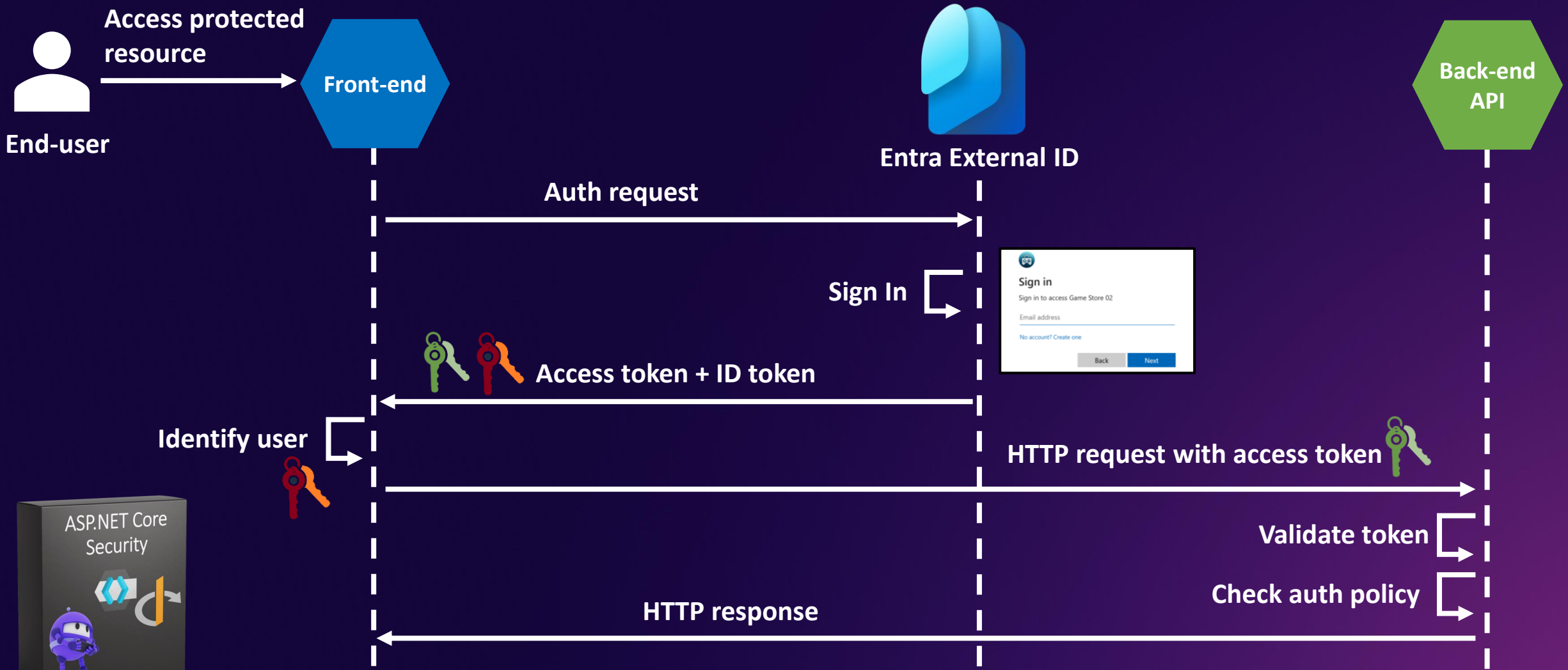
Introduction to Azure Storage

What is Azure Storage?
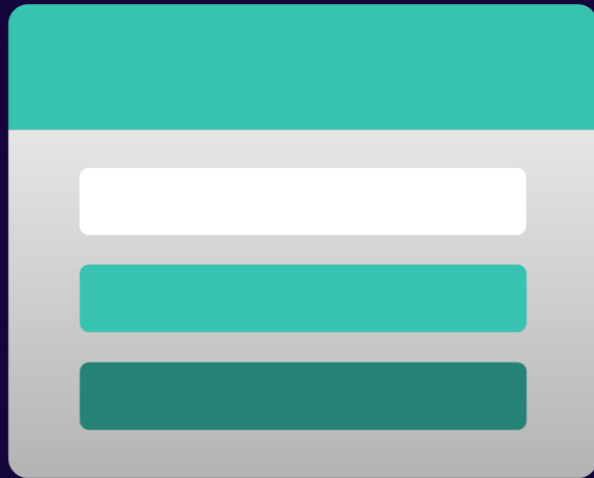
- A suite of cloud storage services for different needs:

- **Azure Blobs:** A scalable object store for text and binary data

- **Azure Files:** Managed file shares for cloud or on-premises

- **Azure Queues:** A messaging store for reliable messaging

- **Azure Tables:** A NoSQL store for storage of structured data

- **Azure Managed Disks:** Block-level storage volumes for VMs

- Offers multiple redundancy options

- All the data is encrypted by the service

- Accessible from anywhere in the world over HTTP or HTTPS

Using Azure Blobs for file uploads

Azure Blobs

File URL

Upload

POST/PUT

Front-end

Game Store API

Save Game
(+file URL)

SQLite DB

Game Store API
Web App

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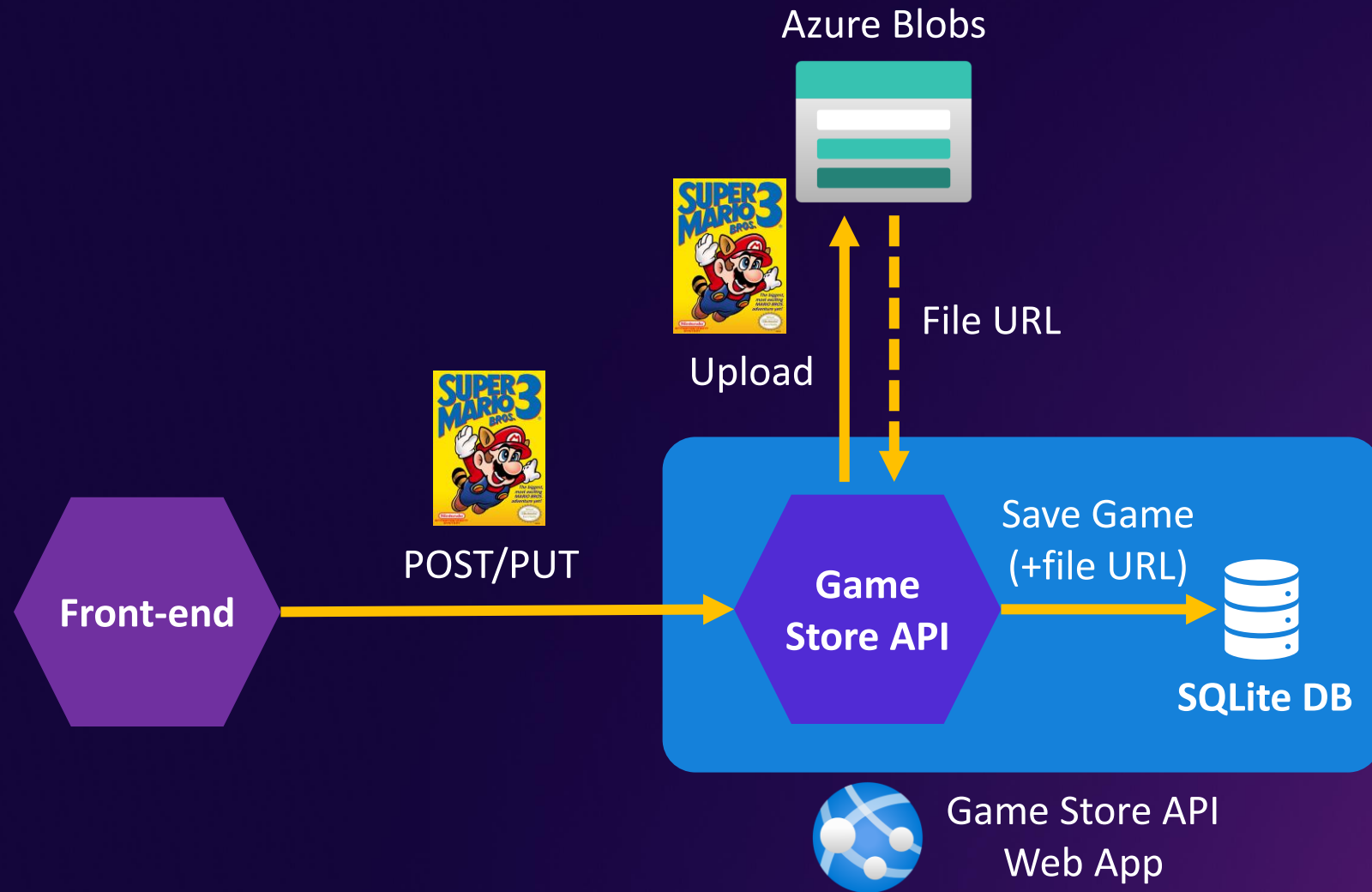
Using Azure Blobs for file downloads

Azure Blobs

Get Game
Image
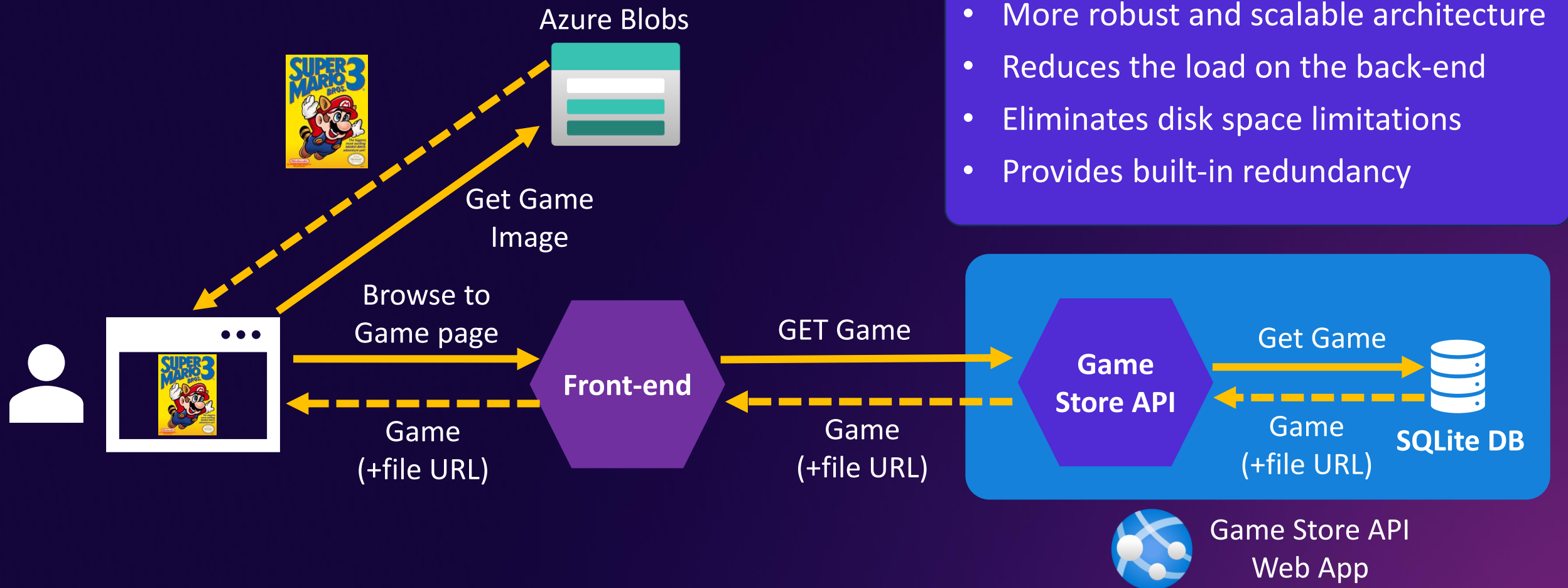
Benefits

- More robust and scalable architecture
- Reduces the load on the back-end
- Eliminates disk space limitations
- Provides built-in redundancy

Browse to
Game page

Front-end

GET Game

**Game
Store API**

Get Game

SQLite DB

Game
(+file URL)

Game
(+file URL)

Game
(+file URL)

Game Store API
Web App

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Introduction to Azure Front Door

What is Azure Front Door?

- Microsoft's global content delivery network (CDN)

- Fast, reliable and secure access to web content

- Uses over 118 edge locations across 100 cities

- Integrates with other Azure services like Storage

- Features integrated web application firewall (WAF) protection

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Using Front Door with Storage

Customer

Japan

Get Game Image

Azure Front Door

Cache

Get Game Image

Azure Storage

USA

1.53 secs

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Using Front Door with Storage

Customer

🇯🇵 Japan

Get Game Image

Azure Front Door

Find Cached Image

Cache

Azure Storage

🇺🇸 USA

1.53 secs
Before

181 ms
Now

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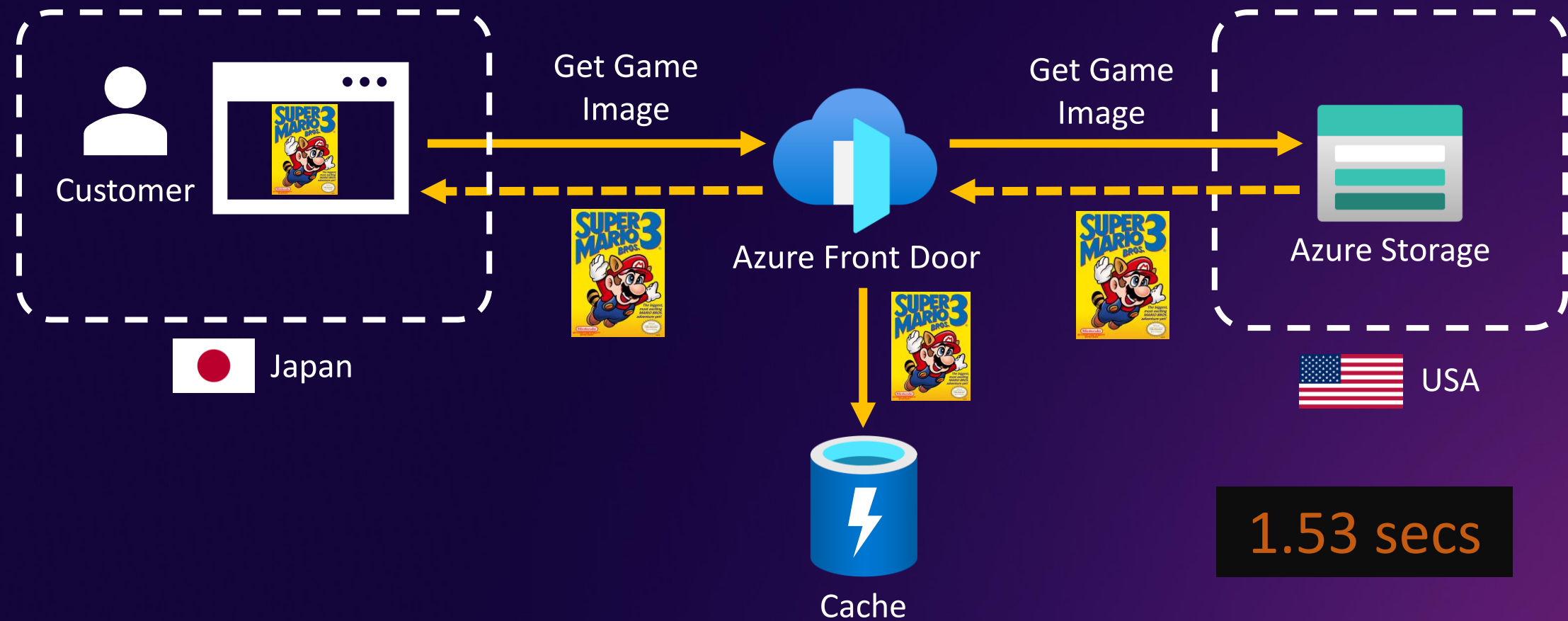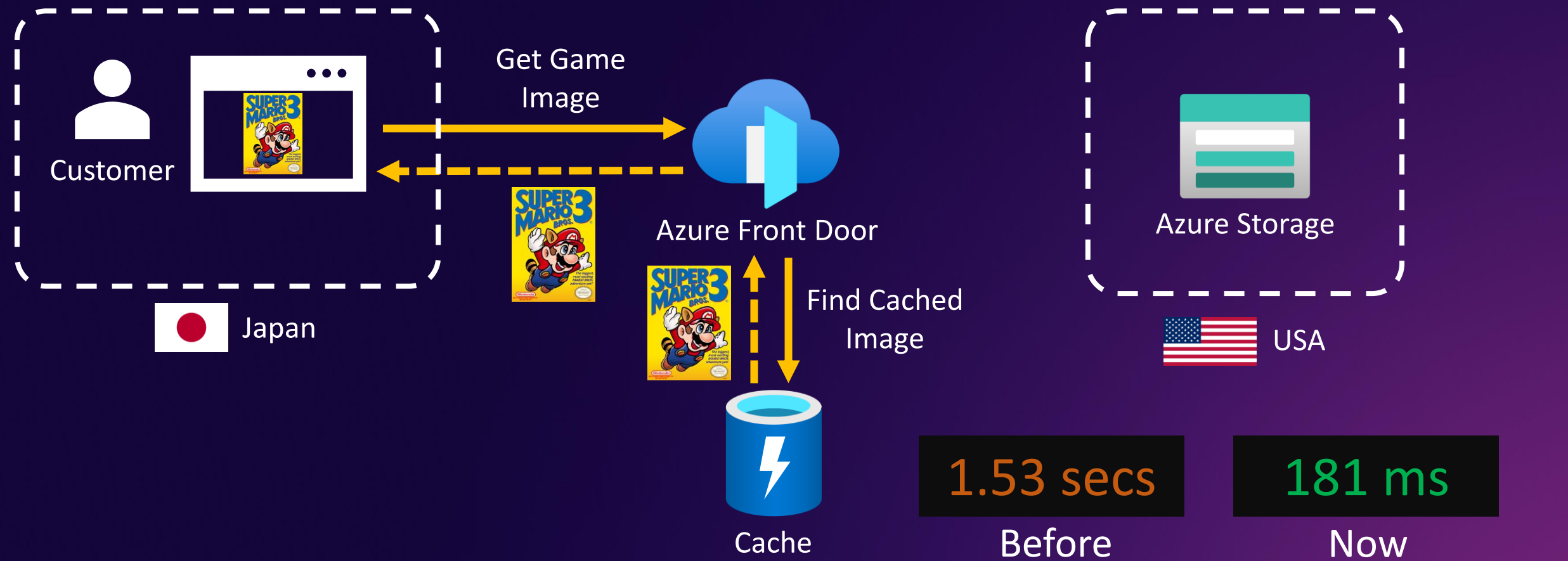
Introduction to Azure Managed Identities

What are Azure Managed Identities?

- Identities in Microsoft Entra for applications to connect to Azure resources

- Used to obtain Microsoft Entra tokens without credentials

- Eliminates credential management in code

- **System-assigned** identities are tied to a specific resource's lifecycle

- **User-assigned** identities can be assigned to multiple services

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Using Azure Managed Identities

Azure Blobs

Grant Access

Game Store Identity

Use token

Assigned identity

Verify identity & permissions

Front-end

Game Store API

Request token

Return token

Microsoft Entra

Game Store API Web App

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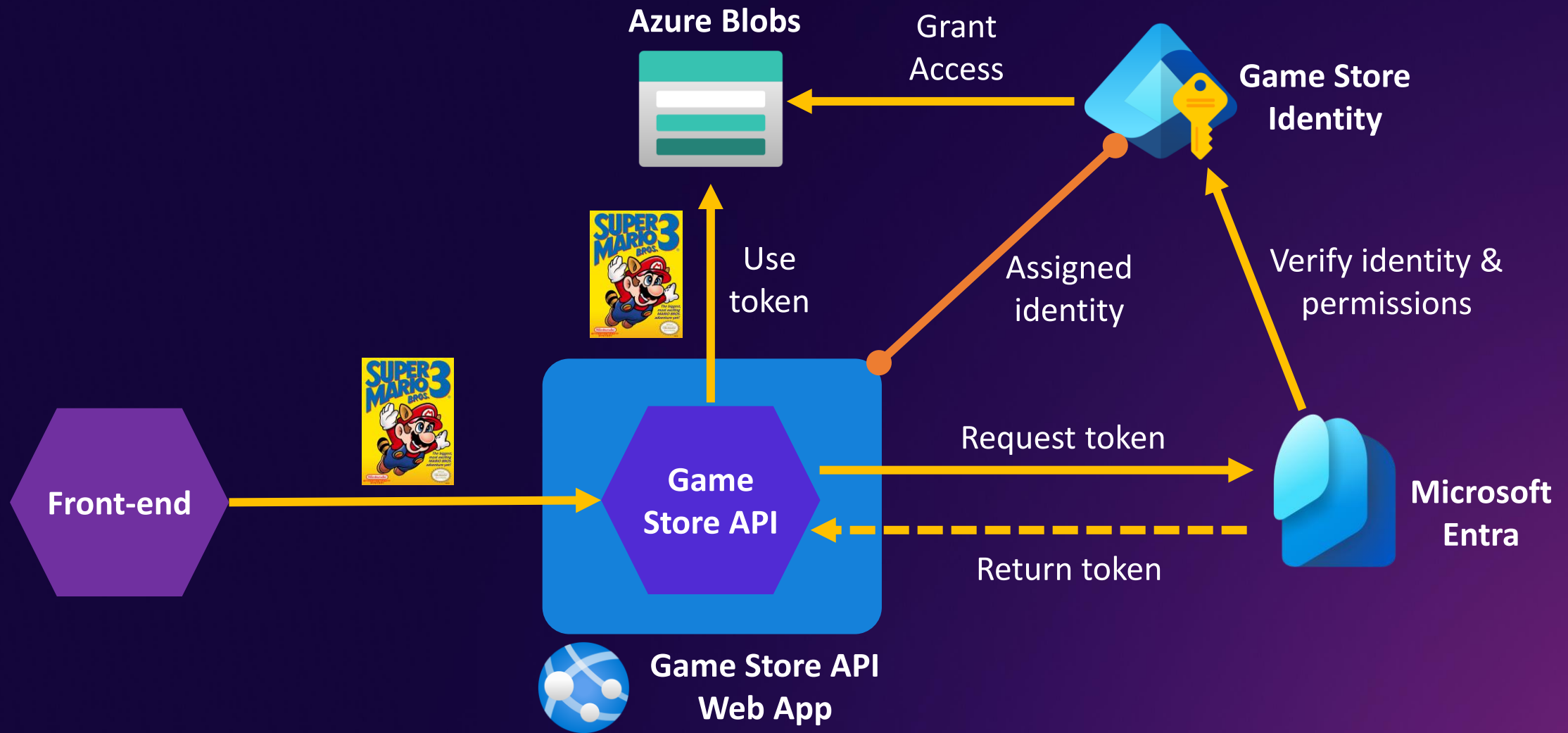
Introduction to Azure Database for PostgreSQL

What is Azure Database for PostgreSQL?

- A fully managed PostgreSQL database service

- Automatic updates of the OS and database engine

- Zone-redundant high availability (99% SLA)

- Automatic backups and point-in-time recovery

- Predictable performance with dedicated compute

- Elastic scaling within seconds

Using Azure Database for PostgreSQL

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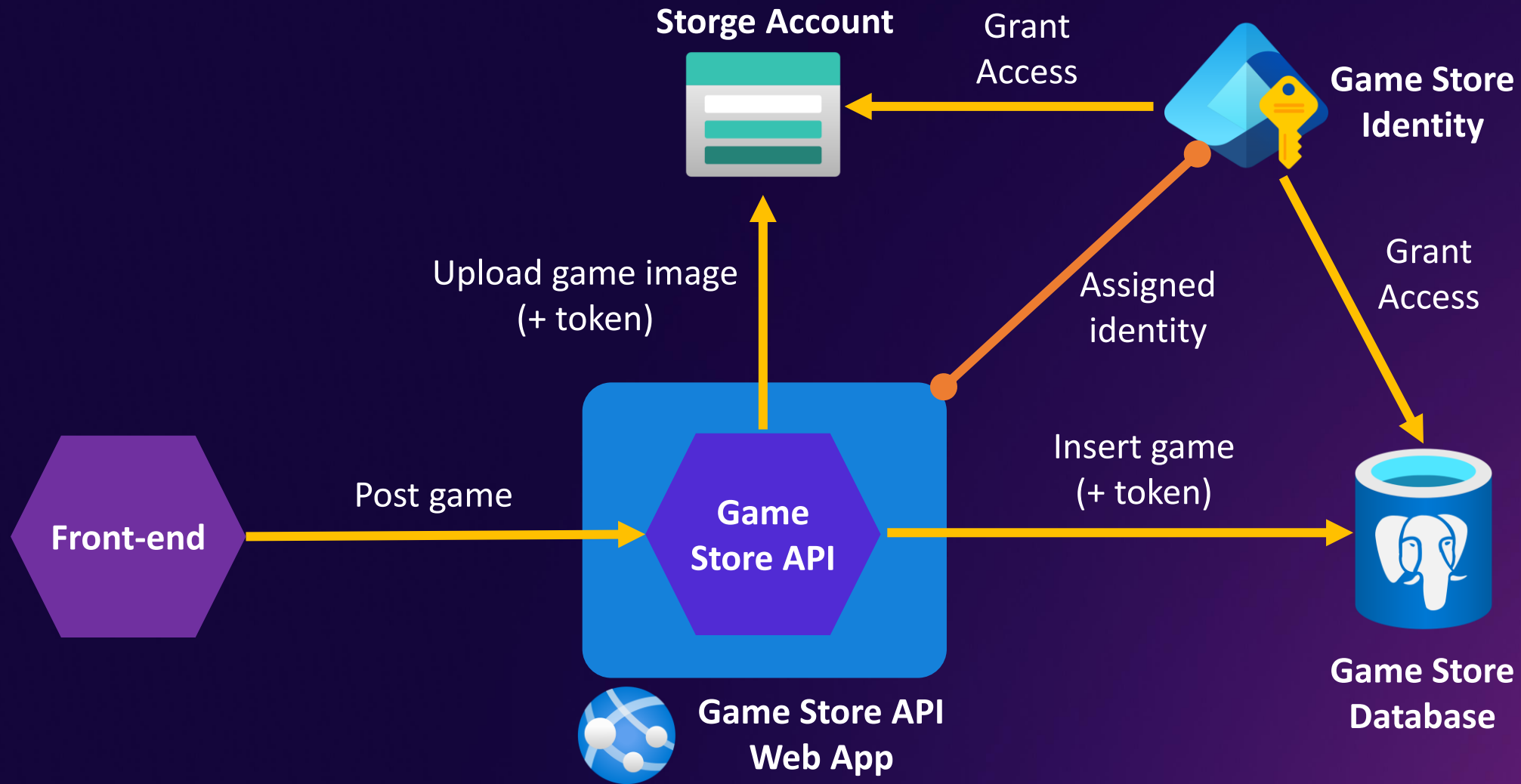
Introduction to Azure Key Vault

What is Azure Key Vault?

- A cloud service to store & manage secrets

- Can also manage encryption keys and certificates

- Performs versioning and rotation of secrets

- Access control via Azure RBAC and Entra ID

- Includes auditing and monitoring capabilities

- Integrates with ASP.NET Core configuration system

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Using Azure Key Vault

Client secret → **Key Vault**

Grant Access ← **Game Store Identity**

Request client secret ↑

Client secret ↓

Assigned identity

Front-End Web App

Env Vars → Client secret → **Blazor Front-end**

Start Auth Flow (with client secret) → **Microsoft Entra**

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